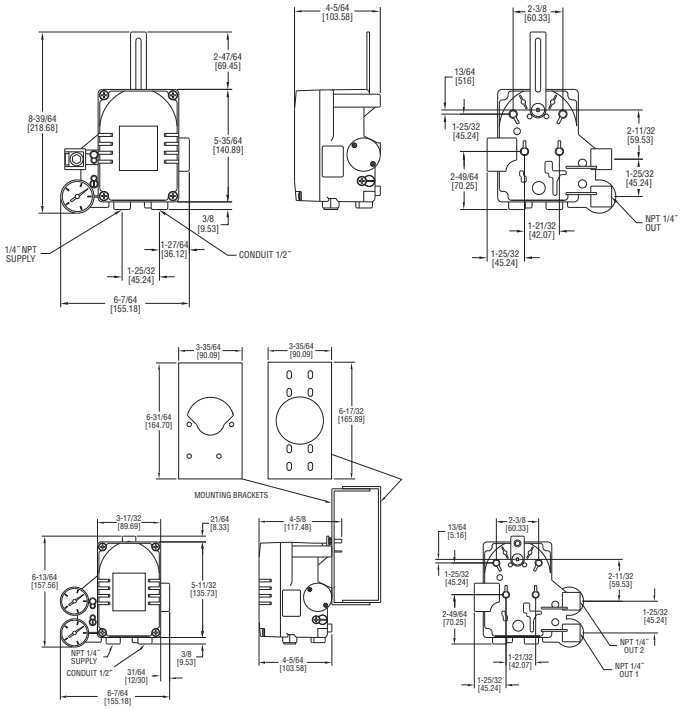
Series 175 & 275 PRECISOR® III Electro-Pneumatic Positioner

Specifications - Installation and Operating Instructions

Series 175

Series 275



Series 175 and 275 PRECISOR® III Electro-Pneumatic Positioners control valve stroke accurately using an input signal of 4-20 mA from the controller. In addition, a highly efficient microprocessing operator built into the product performs various powerful functions such as Auto calibration, PID control, Alarm and Hart® protocol.

FEATURES

- LCD allows user to directly check the positioner condition in the field.
- Endures severe vibration.
- Operates normally regardless of changes in supply pressure during operation.
- Simple to use auto calibration.
- Easily equipped on small actuators because of its small size.
- Low air consumption reduces operating cost.
- Can be used in low voltage (8.5V), leaving no limitation in controller.
- Variable orifice is applied in case of a small actuator, the hunting is controlled to the optimum condition during operation.
- HART® communication processes various information for the valve and positioner.
- Valve system is stabilized by outputting analog feedback signal.
- The adjustment of valve characteristics (Linear, Quick open, Equal percentage) is available.
- Specific flow control is available with setting 16 points at users' command.
- Tight Shut-Close and Shut-Open can be set voluntarily.
- PID parameters can easily be adjusted in the field without additional communicator.
- The pressure of air filter regulator is sent directly to actuator using A/M switch.
- Split ranges such as 4-20 mA, 12-20 mA are available.
- Setting Zero and Span as partial section is available by Hand Calibration function.
- The valve defect is easily checked because the valve can be operated voluntarily.
- Air filter regulator can be attached to the product with only one linear nipple without extra piping.

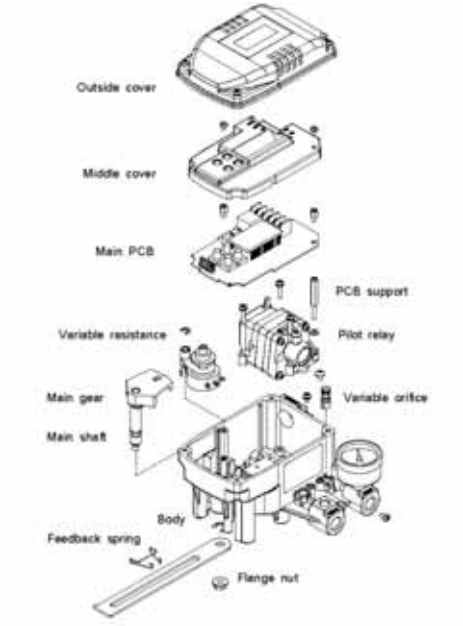
SPECIFICATIONS

Input Signal: 4-20 mA DC.
Input Impedance: 460 Ohm max @ 20 mA DC.
Material: Aluminum diecasting.
Air Supply: 20 to 100 psi (1.4 to 6.9 bar).
Air Connection: 1/4″ NPT.
Gage Connection: 1/8″ NPT.
Conduit Connection: 1/2″ NPT.
Linearity: ±0.5% of full scale.
Hysteresis: ±0.5% of full scale.
Sensitivity: ±0.2% of full scale.
Repeatability: ±0.3% of full scale.
Air Consumption: below 0.07 scfm (2 LPM) at 20 psig (1.4 bar) supply.
Flow Capacity: 2.5 scfm (70 LPM) at 20 psig (1.4 bar) supply.
Stroke: 175: 0.5 to 6″ (10 to 150 mm); 275: 0 to 90°.
Enclosure Rating: NEMA 4X (IP66).
Ambient Temperature: Operating: -40 to 185°F (-40 to 85°C).
Weight: 3.3 lb (1.5 kg).
Lever: 175: 0.39 to 1.57″ (10 to 40 mm); 275: NAMUR.

W.E. ANDERSON DIV., DWYER INSTRUMENTS, INC.
P.O. BOX 358 • MICHIGAN CITY, INDIANA 46361 U.S.A.
Phone: 219/879-8000
Fax: 219/872-9057
www.dwyer-inst.com
e-mail: info@dwyer-inst.com

STRUCTURE

The structure of the Series 175 is shown below. The Series 275 structure is the same as the linear model without the feedback lever.



INSTALLATION

Note: When the positioner is replaced or installed with the actuator, make sure of the following:

• All inputs and supply pressure to the valve, actuator and other instruments must be shut down.

• The control valve must be separated from the system with a bypass valve or other equipment so that the entire system does not shut down.

• No pressure remains in the actuator.

Tools For Installation

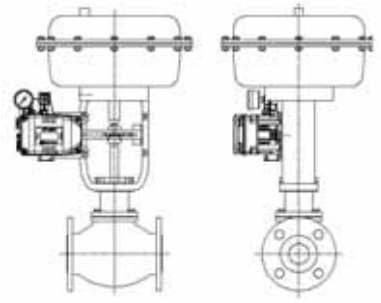
• Hexagonal wrenches
• (+) Screw driver
• (-) Screw driver
• Spanners for hexagon head bolts

Series 175 Installation

Series 175 is used for linear motion valves such as Dwyer Instruments globe or gate valves using a spring return type diaphragm actuator or piston actuator. The Series 175 consists of the following components. Be sure that all the components are included.

1. Series 175 main body
2. Feedback lever and lever spring
3. Flange nut (attached on the bottom of main shaft of Series 175 body)
4. Four hexagon head bolts M8x1.25P
5. Four M8 plate washers

Series 175 installation example

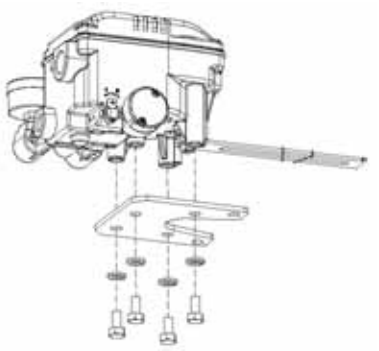


Installing Series 175 with bracket

1. It is necessary to make a proper bracket to attach on the actuator yoke. The most important considerations in the design of the bracket are as follows:
   - Series 175 feedback lever should be level at 50% of valve stroke.
   - Feedback lever connection bar of actuator clamp should be connected in the position so that the valve stroke and the numbers carved on feedback lever are fitted.

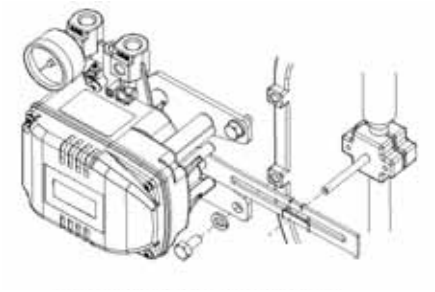
   If the bracket meets the above conditions, Series 175 can be installed very easily.

2. Assemble Series 175 and bracket with bolts. Use standard bolts in bolt holes on the backside of the unit.

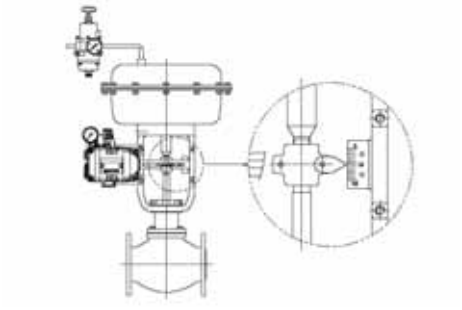


Installing Series 175 with bracket

3. After assembling Series 175 and bracket with bolts, attach it using bolt holes of actuator yoke. Do not tighten completely. There must be some space.
4. Install bar connected with Series 175's feedback lever on the actuator clamp. The slot length between Series 175's feedback lever is 0.26″ (6.5 mm), so the diameter of the connection bar should be less than 0.25″ (6.3 mm).
5. Connect the air filter regulator with the actuator temporarily. Set supply



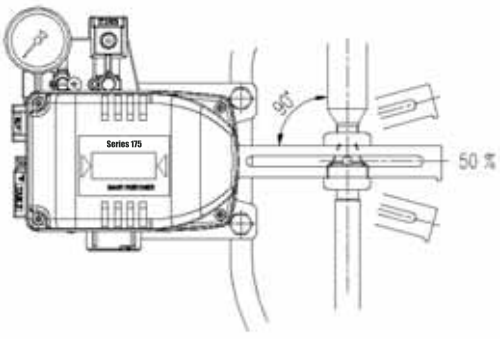
pressure of air filter so that the actuator clamp is positioned at 50% of valve stroke.



6. Insert the connection bar attached on the actuator clamp into the slot of Series 175's feedback lever. In order to reduce hysteresis, it should appear as shown:

The connection bar inserted correctly between feedback lever and lever spring

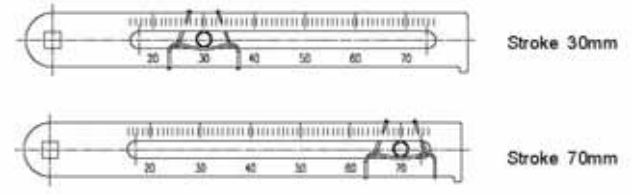
7. Check that Series 175's feedback lever is level at 50% of valve stroke. If not, move bracket or feedback link bar until it is level. Product linearity becomes worse if Series 175 is installed without being level at 50% of



Feedback lever being leveled correctly

valve stroke.

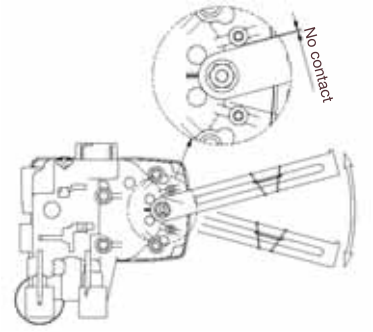
8. Check valve stroke. The numbers indicating stroke are carved in the Series 175's feedback lever. Set connection bar attached on actuator clamp to the number on the feedback lever applicable to valve stroke as shown in the following picture. To set the connection bar and the number, move the bracket attached on Series 175 or connection bar



Installation position of connection bar for valve stroke

from side to side.

NOTE: After installation, operate the valve from 0 to 100% stroke using an air filter regulator on the actuator. When the stroke is both 0 and 100%, feedback lever should not reach to the lever stopper on the backside of the Series 175 unit. If feedback lever reaches the lever stopper, move attachment position of Series 175 away from the yoke center.



Check whether or not lever stopper and feedback lever are in contact

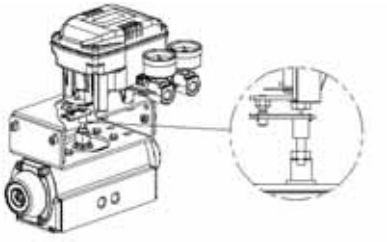
9. Once the Series 175 is installed according to the above procedures, tighten the bolts and nuts of the bracket and feedback lever connection bar completely.

Series 275 Installation

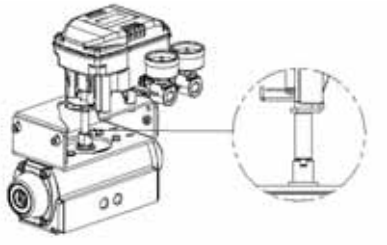
Series 275 is designed for rotary motion valves such as Dwyer Instruments ball and butterfly valves using rack and pinion, scotch yoke or complex type actuators whose stem is rotated 90°. Series 275 positioners consist of the following components:

1. Series 275 main body
2. Fork lever and lever spring to attach on actuator
3. 1 bracket
4. Four hex bolts M8x1.25P
5. Four M8 plate washers

Series 275 installation example



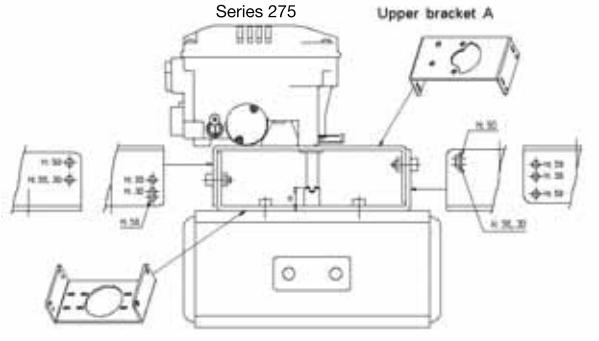
Series 275 installation example of fork lever



Series 275 installation example of Namur shaft

Installing Series 275 with bracket

Series 275 is supplied with a standard bracket. The bracket consists of two parts and is used with a NAMUR shaft. The bracket is assembled in the factory based on 0.79″ (20 mm) of actuator stem height. If the actuator stem height is higher, such as 1.18″ (30 mm), or 1.97″ (50 mm), reassemble the bracket adjusting to the actuator stem height. Refer to the table below to check hole positions.

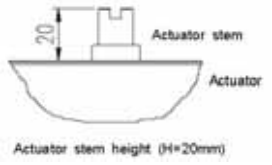


Bracket assembly method by actuator stem height H

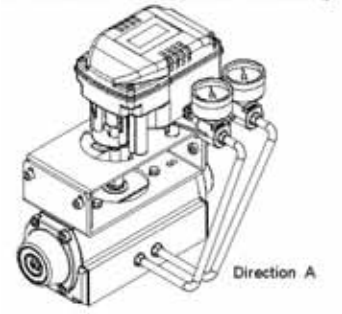
Actuator stem height (H)	Markings of bolt holes			
	A-L	**B-L**	**A-R**	**B-R**
20 mm	H: 20	H: 20, 30	H: 20	H: 20, 30
30 mm	H: 30	H: 20, 30	H: 30	H: 20, 30
50 mm	H: 50	H: 50	H: 50	H: 50

Ex) If H is 30 mm, A-L should be locked in H:30 hole, B-L in H:20,30, A-R in H:30, and B-R in H:20,30 with bolts.

1. Typical actuator stem heights (H) are 0.79, 1.18 and 1.97 inches (20, 30, and 50 mm). After checking H, assemble brackets following previous guidelines. The bracket is set at 0.79″ (20 mm) in the factory.

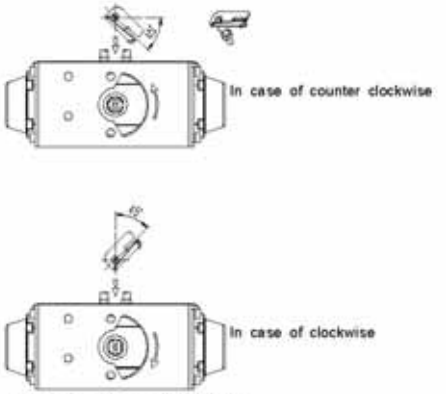


2. Attach bracket to the actuator using hex bolts. The diameter of the bracket bolt holes are 0.24″ (6 mm). Use spring washers or thread lock compound so the bolts will not be loosened by vibration or impact. The direction of the bracket varies by operating conditions, but the normal direction is depicted in the following picture. That is, when the piping of actuator and Series 275 is as shown direction A, the bracket hole and indicator attached on the bottom of the Series 275 main shaft should be mounted in the same direction.



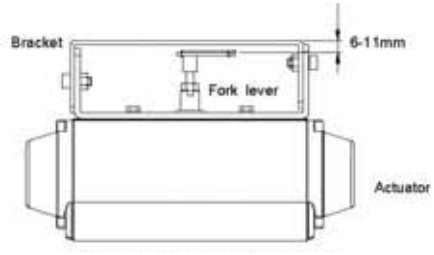
Attachment direction of bracket and actuator

3. Set the rotation position of actuator stem as the initial zero point, which is 0% stroke. For a spring return type actuator, the actuator stem is always rotated to the zero point without supply pressure, making it easy to check the zero point. If the actuator is double-acting, check whether the rotation direction of the actuator is clockwise or counter-clockwise or the rotation direction of actuator using supply pressure.
4. Set the actuator stem as the initial zero point and install a fork lever as shown in the following picture. Confirm the position of initial zero point when actuator stem is turned clockwise and counter-clockwise. Installation angle of fork lever should be about 45 degrees based on the linear shaft. But the angle is not related to NAMUR shaft.



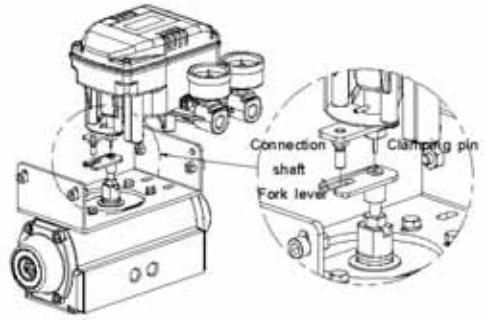
Installation position of fork lever

5. Once the fork lever position is set, lock the check nuts on the bottom of the fork lever by turning clockwise. Set the upper height of the fork lever to 0.24 to 0.43”(6 to 11 mm) lower than the upper height of the bracket.



Height of bracket, fork and fork lever

6. Attach Series 275 unit to the bracket. Fix the clamping pin on the main shaft center of the Series 275 into the hole of the fork lever. Insert the connection bar attached on the main shaft lever into the fork lever slot to be locked by the fork lever spring. This is to fit the main shaft of the Series 275 to the center of the actuator stem. If they are not fitted correctly, too much force on the main shaft will greatly reduce product durability.
7. Attach Series 275 base and the bracket with hex bolts and plate washers. It is best to lock the bracket and Series 275 together by inserting



Fitting the pin on the Series 275 main shaft into fork lever hole

four bolts after checking the position.

PIPING CONNECTION

Note:

1. To prevent ingress of moisture, oil and dust, give careful consideration to the choice of supply pressure compressor and piping.
2. It is recommended to attach filter or air filter regulator in front of the supply port of the Series 275 unit.

Conditions of Supply Pressure

1. Dry air with a dew point that is at least 50°F (10°C) lower than that of the ambient temperature.
2. Free from solid particles. Result of being passed through 5 micron or finer filter.
3. Does not contain oil or lubricating oil.
4. Comply with ANSI/ISA-57.3 1975(R1981) or ISA S7.3-1975(R1981).
5. Not used beyond the range of 20 to 100 psi (140 to 700 kPa).
6. Set supply pressure of air filter regulator to 10% higher than operating pressure of actuator.

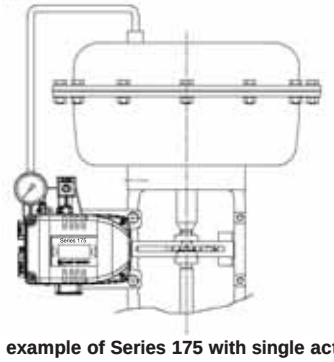
Conditions of Pipe

1. Remove foreign objects from inside of pipe.
2. Do not use squeezed or broken pipe.
3. To maintain flow rate of Series 275, use a pipe with inner diameter greater than 0.24″ (6 mm) (outer diameter 0.39″ (10 mm)).

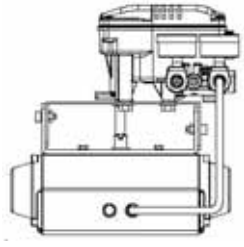
Piping Connection With Actuator

Single Acting Actuator

Series 175, and Series 275 single acting units are set to use OUT1 port. Therefore, when using the single acting spring return actuator, OUT1 port should be connected to the supply pressure port of the actuator.



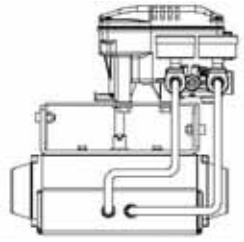
Piping connection example of Series 175 with single acting actuator



Piping connection example of Series 275 with single acting actuator

Double Acting Actuator

For the Series 275 double acting type, OUT1 and OUT2 ports are used.

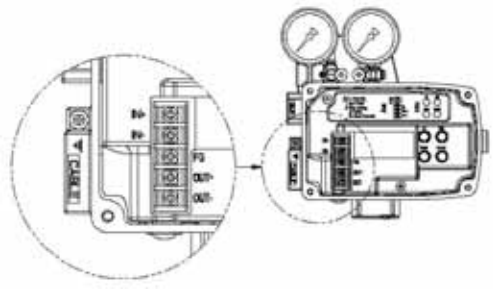


Piping connection example of Series 275 with double acting actuator

Power Connection

Note:

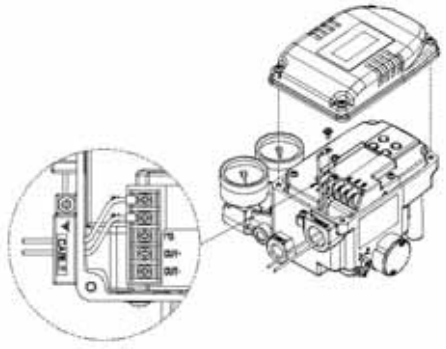
1. Before connecting terminal, power must be shut off.
2. Use ring type terminal against oscillation, impact, etc.
3. Series 175 and 275 positioners use 4 to 20 mA DC for power. Minimum supply current is 3.2 mA (standard type) and 3.8 mA (HART® type). Maximum supply current must not exceed 24 mA.
4. In order to protect the Smart Positioner, the ground terminals should be grounded.
5. Use twisted cable with conductor sectional area at least 0.0019 in^2 (1.25 mm^2), and suitable for 600V as on conductor table of NEC Article 310. Outer diameter of cable should be 0.25 to 0.39″ (6.35 to 10 mm). Use shielded wire against electromagnetic waves and noise.
6. Do not install the cable near equipment such as a high-capacity transformer or motor.



Terminal plate of Series 175 & 275

Terminal Connection of Current Input Signal

1. Open cover by loosening the four M4 bolts on positioner cover.

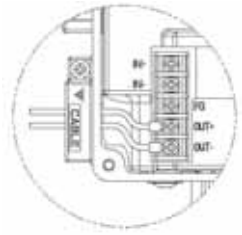


Terminal connection of input current signal

2. Loosen locking bolts of terminal plate.
3. Insert a cable through the cable connector in the positioner.
4. Use a ring type cable terminal so that it does not come out.
5. Insert terminal bolts in terminal holes of cable and lock them with (+) terminal and (–) terminals on the terminal plate. Tighten terminal bolts with 1.1 lbs-ft (15 kfgcm) torque.
6. Be sure not to change the polarity of terminals.

Terminal Connection of Feedback Signal

1. Open cover by loosening the four M4 bolts on the positioner cover.
2. Loosen terminal locking bolts of feedback signal terminals.

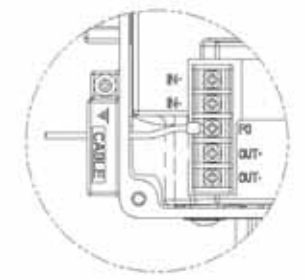


Terminal connection of transmitter

3. Insert a cable through the cable connector in the positioner.
4. Use a ring type cable terminal so it does not come out.
5. Insert terminal bolts in terminal holes of cable and lock them with (+) terminal and (–) terminals on the terminal plate. Tighten terminal bolts with 1.1 lbs-ft (15 kfgcm) torque.
6. Be sure not to change polarity of terminals.

Inner Terminal Connection for Ground

1. The ground is necessary for the safety of the positioner and system.
2. The ground terminals are inside the terminal in the center of the terminal plate and outside terminal beside outer cable entry. Use any ground



Ground terminal connection

terminal that is available and resistance must be less than 100 Ohm.

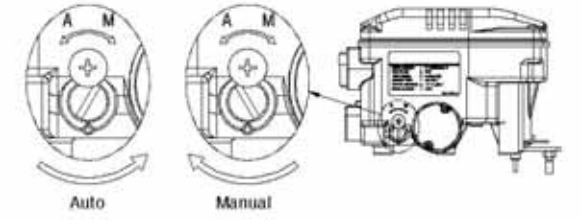
3. For use with inside ground, open cover by loosening the four M4 bolts of positioner cover.
4. In order to maintain the ground connection, use a ring type ground cable terminal to prevent it from coming out.

A/M Switch (Auto/Manual switch)

There is an A/M switch on the bottom of the Series 175 and 275 positioners. If this switch is set as auto, supply pressure is transmitted to actuator by the operation of the postitioner. If it is set as manual, supply pressure of air filter regulator is transmitted to actuator regardless of positioner.

* When A/M switch is set as manual, make sure that too much pressure is not transmitted to the actuator.

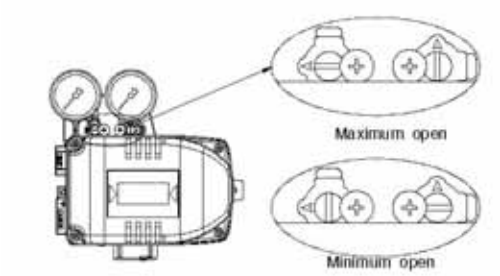
1. Check if the supply pressure of air filter regulator is too high.
2. Turn the switch clockwise and supply pressure of air filter regulator is transmitted to actuator.
3. If the switch is turned counter-clockwise, the positioner is operated



manually.

Variable Orifice

Hunting can occur if the actuator volume is too small. In this case, adjust the variable orifice using a (-) flathead screwdriver. Hunting is prevented by



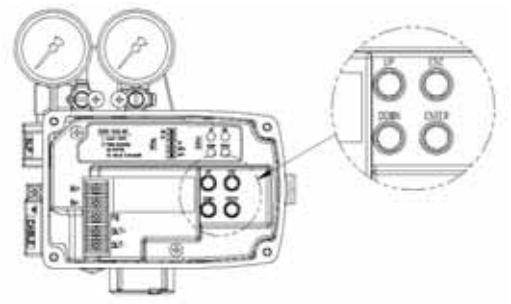
reducing the flow rate of supply pressure transmitted to actuator.

Auto Calibration and Basic Operations

Warning: Since this makes the valve or actuator move, before auto calibration, the valve must be separated from entire system.

Buttons Operations

Series 175 and 275 positioners perform various functions using four but-



tons. The position of the buttons is shown below:

<Enter> : It is used to go to the main menu, save adjusted parameter values, or choose sub menus.

<Esc> : It is used to return to previous menu.

<UP> : It is used to move to another menu or change parameter values.

<DOWN>: It is used to move to another menu or change parameter values.

RUN Mode

After connecting power to the positioner, the following is displayed on the

LCD in 6 seconds.

RUN on the bottom line means that the Smart Positioner adjusts valve stroke based on an outside signal (4-20 mA) and PV refers to the number on the LCD. In RUN mode, valve stroke is changed according to input sig-

1	Run PV	Valve stroke of Process Value (%)
2	Run SV %	Input signal of Set Value (0-100%)
3	Run SV mA	Input signal of Set Value (4-20 mA)
4	Run MV	Motor controlled variable of Manipulate Value (Digit)
5	Run Vel	Current valve speed (Digit)
6	Run Err	Difference between SV and PV (%)

nal. There are six options displayed in RUN mode.

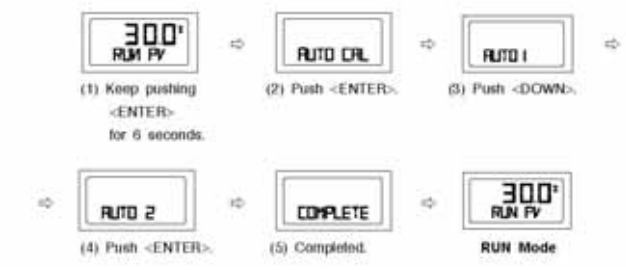
In order to change display, push <ESC> and <UP> at the same time. When the buttons are pushed, display order is changed. If the <ESC> and <DOWN> buttons are pushed simultaneously, the order is opposite and if <ESC> is pushed only, display returns to RUN mode.

First Auto Calibration

First auto calibration is usually used when the positioner has not been set, such as the initial setting with valve at the valve company or replacement with other product in the field. In this case, all parameters are set by using

AUTO2 calibration.
Warning: When the positioner is installed on the valve in the field after setting, we recommend using AUTO1 calibration rather than AUTO2 calibration. This is because the valve company sets optimum parameters so it is better that those registered parameters are not changed by AUTO1 calibration.

1. Connect power. Any values between 4 to 20 mA (DC) can be used for power. After connecting power 'READY 6, 5, 4, 3, 2, 1' message appears on the LCD, which means preparing to operate PCB circuit and parts. The following message is displayed in 6 seconds. Push <ENTER> for 6 seconds at RUN mode and AUTO CAL message should appear.
2. Push <ENTER> and then AUTO1 mode is started.
3. Push <DOWN> and AUTO2 mode is displayed.
4. Push <ENTER> at AUTO2 mode. Auto 2 calibration is started and the next modes are displayed in order on the LCD. Normally it will take 3 to 5 minutes for auto calibration in AUTO2 mode, but it can be different based on actuator's volume.
5. When Auto calibration is done, 'COMPLETE' message appears on the LCD. After 4 seconds the procedure is returned to RUN mode and valve stroke by current input signal is displayed as a percentage.
6. Zero, Span, PID parameters and RA/DA are automatically set when



Auto 2 calibration is completed.

Entire Modes and Functions

Auto calibration (AUTO CAL)
The calibration of the Positioner is simply performed by Auto calibration. There are 5 types of Auto calibration: AUTO1, AUTO2, AUTO3, BIAS, V_0.

AUTO1 calibration is useful for users in the field. AUTO2 calibration is for valve companies or the initial parameter setting for the postitioner.

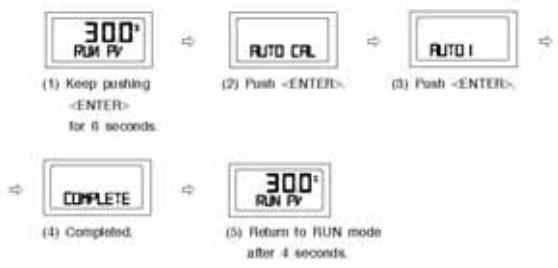
It takes about 2-3 minutes for Auto calibration and it can be different based on the actuator's volume. AUTO1, AUTO2, and AUTO3 calibration set the RA/DA automatically.

	Zero POINT	END POINT	KP,KI KD	BIAS	V_0	RA / DA
AUTO1	○	○		○	○	○
AUTO2	○	○	○	○	○	○
AUTO3			○	○	○	○
BIAS				○		
V_0					○	

Auto calibration types

Auto Calibration Types

Auto 1 Calibration (AUTO1)
In this mode, all parameters necessary for valve operation are set except KP, KI, KD. It is used to re-execute calibration by users in the field after being supplied the postitioner unit whose parameters were set by the valve company.
1. Push <ENTER> for 6 seconds in RUN mode and AUTO CAL message should appear.
2. Push <ENTER> and then AUTO1 mode is displayed.
3. Push <ENTER> again at AUTO1 mode and Auto 1 calibration is started.
4. When Auto 1 calibration is done, 'COMPLETE' message appears on the LCD. After 4 seconds the procedure returns to RUN mode and the



valve stroke by current input signal is displayed as a percentage.

Auto 2 Calibration (AUTO2)
All parameters necessary to operate valve are set. This calibration is used when the positioner is first installed with valve. Refer back to First Auto Calibration.

Auto 3 Calibration (AUTO3)
All parameters necessary to operate valve are set except zero and end point. This function is used to re-execute auto calibration without changing the zero and end point after adjusting them manually.

1. Push <DOWN> at AUTO2 and AUTO3 is displayed.
2. Push <ENTER> and AUTO3 calibration is started. The remaining procedures of this calibration are the same as other calibrations.

BIAS Calibration
BIAS means standard value of motor control that is used in the positioner. It is affected by supply pressure, KP and other values. Therefore it should be re-adjusted if supply pressure or KP is changed. Unless this value is correctly set, accuracy can be very low.

1. Push <DOWN> at AUTO3 mode and BIAS mode is displayed.
2. Push <ENTER> and BIAS calibration is started. The remaining procedures of this calibration are the same as other calibrations.

Velocity Calibration (V_0)
This function is used to find the standard value to recognize accurate valve speed. Unless this value is correctly set, KI control can be slower or impossible. In order to check if this value is accurately set, push <ESC> at RUN mode. RUN Vel is displayed. At this time the number on the bottom line of the LCD indicates the value close to zero. (After valve is stopped) usually the number is between –2 and 2. If the number is over 5, execute this function again and reset V_0 value.

1. Push <DOWN> at BIAS mode and V_0 mode is displayed.
3. Push <ENTER> and V_0 calibration is started. The remaining procedures of this calibration are the same as other calibrations.

Manual Mode

Manual mode is used to raise or lower the valve stem manually. In this mode, valve stroke is adjusted only by operating buttons, not by the current input signal. This mode does not affect controlling data registered in the positioner. It only is used to move the valve stem up and down.

1. Push <ENTER> at RUN mode until AUTO CAL message is displayed.
2. Push <DOWN> and MANUAL mode is displayed.
3. Push <ENTER> again. Two lines appear on LCD. The upper line indicates valve stroke by percentage and the lower line indicates absolute value of inner resistance of the positioner. *MA means that Manual mode is in operation.
4. Push <UP> or <DOWN> and valve stem moves up or down. Regardless of RA/DA, if <UP> is pushed, valve stem moves up (in case of linear valve). If <DOWN> is pushed, valve stem moves down. In order to make the valve stem move fast, push <ENTER> with <UP>, or <DOWN>.

Push <UP>.	Valve stem moves up slowly.
Push <UP> + <ENTER> at the same time.	Valve stem moves up quickly.
Push <DOWN>.	Valve stem moves down slowly.
Push <DOWN> + <ENTER> at the same time.	Valve stem moves down quickly.

Button operation for valve stem movement

5. Push <ESC> and MANUAL mode is displayed.

Parameter Mode (PARAM)

Parameter types

There are four types in Parameter mode: Dead Zone, KP, KI, and KD.

These values are reflected as soon as they are changed, therefore the appropriate values are found by checking the valve's motion in real time.

Dead Zone (dEAdZONE)

This is the range of error % that the positioner is not adjusted. Hunting or oscillation due to friction between the stem and packing is prevented by this parameter.

KP

This is a proportion constant value that is correcting by error %. If this value is too big, there can be hunting, even though it finds position by the input signal. If the value is too small, accuracy gets worse.

KI

This is an integral constant value adding or subtracting the correction that is corrected error % on the previous correction signal. If this value is too big, there can be oscillation. If it is too small, the time to find the exact position increases.

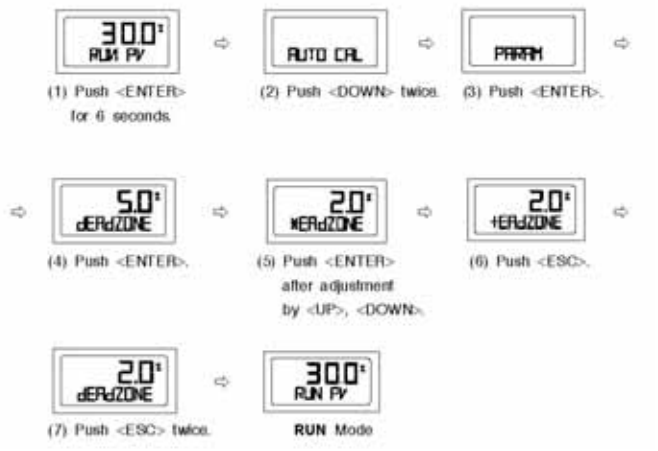
KD

This is a differential constant value adding the previous correction signal with the changing correction signal by the error % change rate.

Adjustment of Parameter

Dead Zone (dEAdZONE)

1. Push <ENTER> at RUN mode for 6 seconds and AUTO CAL message appears.
2. Push <DOWN> twice and PARAM mode is displayed.
3. Push <ENTER> and dEAdZONE mode is displayed.
4. Push<ENTER> again and *EAdZONE message appears.
5. Adjust dEAdZONE value by pushing <UP> or <DOWN>. Adjusted value is applied immediately without additional operation. Users can easily check its adjustment by changing the current input signal to the positioner. Optimum control value is found by adjusting values during valve operation.
6. Push <ENTER> to save the value. +EAdZONE message appears on LCD.

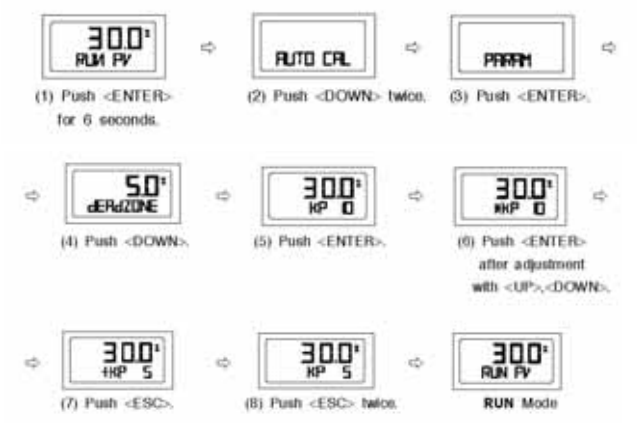


7. Push <ESC> three times to return to RUN mode.

KP

1-3. Adjustment method and procedure same as dEAdZONE.

4. Push <DOWN> at dEAdZONE mode and KP mode is displayed.
5. Push <ENTER> and *KP message appears on LCD.
6. Adjust KP values with <UP> or <DOWN>. Adjusted value is applied immediately without additional operation. Users can easily check its adjustment by changing the current input signal to the positioner. Optimum control value is found by adjusting values during valve operation.
7. Push <ENTER> to save the value. +KP message appears on LCD.
8. Push <ESC>.

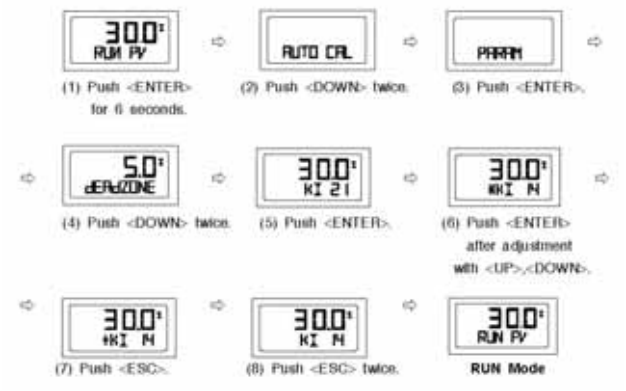


9. Push <ESC> twice to return to RUN mode.

KI

1-3. Adjustment method and procedure same as dEAdZONE.

4. Push <DOWN> twice at dEAdZONE mode and KI mode is displayed.
5. Push <ENTER> at KI mode and *KI message appears on LCD.
6. Adjust KI value with <UP> or <DOWN>. Adjusted value is applied immediately without additional operation. Users can easily check its adjustment by changing the current input signal to the positioner. Optimum control value is found by adjusting values during valve operation. Push <ENTER> to save the value and +KI message appears on LCD.
7. Push <ESC>.

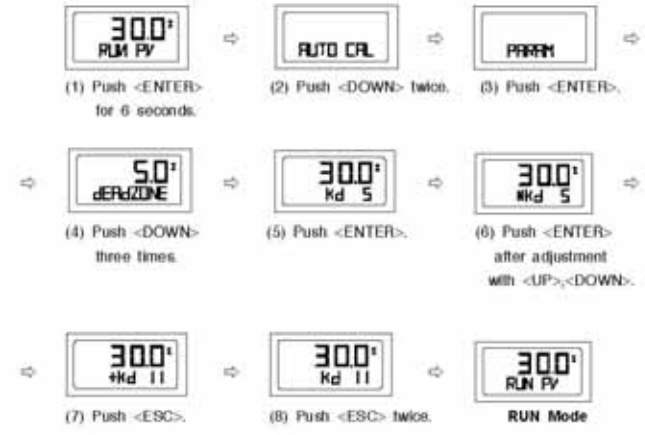


8. Push <ESC> twice to return to RUN mode.

Kd

1-3. Adjustment method and procedure same as dEAdZONE.

4. Push <DOWN> three times at dEAdZONE mode and Kd mode is displayed.
5. Push <ENTER> at Kd mode and *Kd message appears on LCD.
6. Adjust Kd value with <UP> or <DOWN>. Adjusted value is applied immediately without additional operation. Users can easily check its adjustment by changing the current input signal to the positioner. Optimum control value is found by adjusting values during valve operation. Push <ENTER> to save the value and +Kd message appears on LCD.
7. Push <ESC>.



8. Push <ESC> twice to return to RUN mode.

HAND CAL

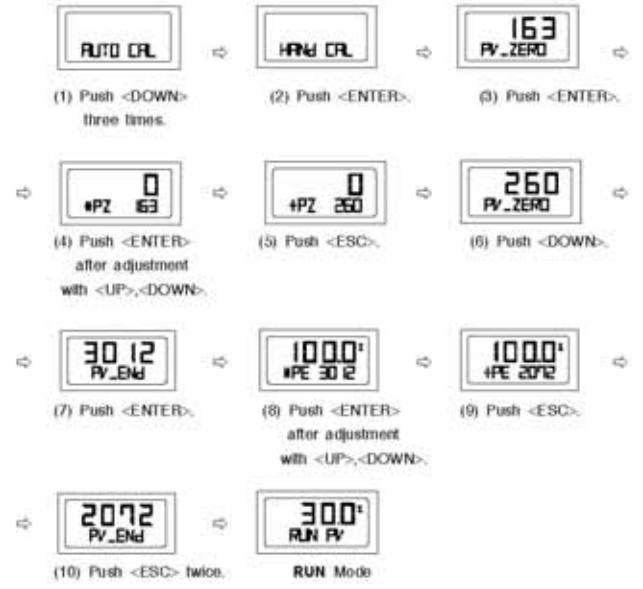
When auto calibration is started, Series 175 and 275 positioners set zero points and end points based on full stroke.

Hand Calibration Types

PV_ZERO: Edit mode to change the zero point of valve.
PV_END : Edit mode to change the end point of valve.
TR_ZERO : Edit mode to change the zero point of transmitter.
TR_END: Edit mode to change the end point of transmitter.

Adjustment of valve zero point (1 to 5) and end point (6 to 10).

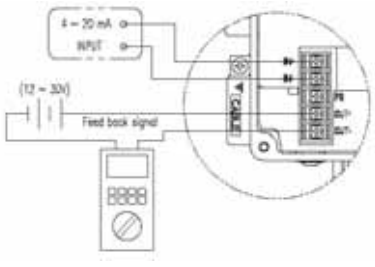
1. Push <ENTER> at RUN mode for 6 seconds and then AUTO CAL mode is displayed. Push <DOWN> three times, the HAND CAL mode is displayed.
2. Push <ENTER> at HAND CAL mode and PV_ZERO mode is started.
3. Push <ENTER> at PV_ZERO mode and *PZ mode is started. At this mode it is available to change valve zero point, and the valve stem moves automatically to the current zero point. On LCD, valve stroke is displayed as 0%. +PZ message that indicates edit mode of zero point and inner value showing current zero point position is also displayed.
4. Adjust valve stem by pushing <UP> or <DOWN>. When valve stem has arrived at the desirable zero point, save it with <ENTER>. +PZ message appears on LCD.
5. Push <ESC> to return to PV_ZERO mode.
   (Push <ESC> twice to return to RUN mode.)
6. In order to change valve end point, push <DOWN> at PV_ZERO mode and PV_END mode begins.
7. Push <ENTER> at PV_END mode and *PE mode is displayed. At this mode it is available to change valve end point, and the valve stem moves automatically to current end point. On LCD, the valve stroke is displayed as 100%. *PE message indicating edit mode of end point and inner value of end point is also displayed.
8. Adjust valve stem with using <UP> or <DOWN>. When valve stem arrives at desirable end point, save it with <ENTER>. +PE message appears on LCD.
9. Push <ESC> to return to PV_END mode.
10. Push <ESC> twice and RUN mode is displayed.



(Push <DOWN> at PV_END mode to go to TR_ZERO mode).

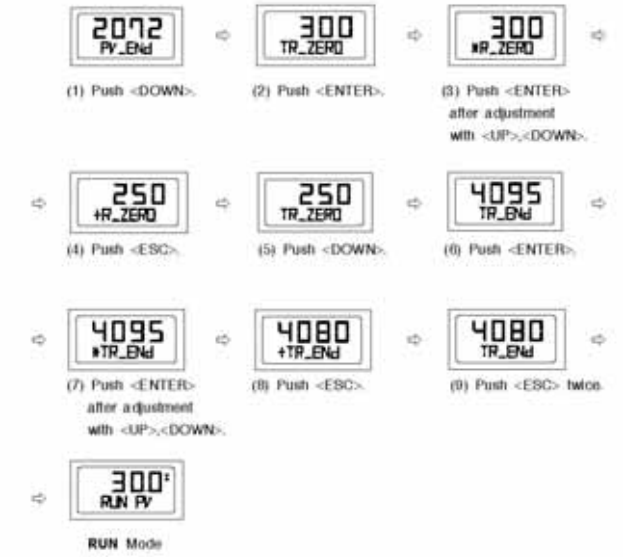
Adjustment of zero point (1 to 4), end point (5 to 9) of transmitter.

If valve zero point and end point are changed, transmitter is also changed automatically. Usually there is no need for the transmitter zero point and end point to be adjusted by users, but if transmitter output signal is unstable, transmitter zero point and end point should be adjusted. The ammeter showing feedback signal is necessary and the connection should be



done as shown.

1. Push <DOWN> at PV_END mode and then TR_ZERO mode is displayed.
2. Push <ENTER>. *R_ZERO mode is started and at this mode users can adjust the zero point of the transmitter. Valve stem is moved to zero point automatically.
3. Push <UP> or <DOWN>. The number on the LCD is changed and the measured current value is changed accordingly on an ammeter equipped outside. Adjust it to be 4mA and push <ENTER> to save it. +R_ZERO message is displayed.
4. Push <ESC>. TR_ZERO mode is displayed.
5. Push <DOWN> at TR_ZERO mode. Then TR_END mode is displayed. (Push <ESC> twice to return to RUN Mode.)
6. Push <ENTER>. *TR_END mode is started and at this mode users can adjust the end point of transmitter. Valve stem is moved to the end point automatically.
7. Adjust measured current value to be 20 mA on ammeter with <UP> or <DOWN> buttons. Push <ENTER> to save it. +R_END message appears.
8. Push <ESC>. TR_END mode is displayed.



9. Push <ESC> twice to return to RUN mode.

Valve Mode

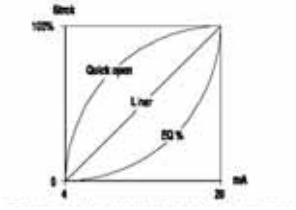
This mode adjusts the various characteristics.

Action Type (ACT)

It can be set to Direct Action (DA) or Reverse Action (RA).

Characteristics (CHAR)

It is set Characteristics. There are three types of valve characteristics: Linear (LIN), EQ% (EQ), and Quick Open (QO). The following is the example of the three characteristic curves.



User Characteristics (USER SET)

When a specific characteristic is needed but not included in the above characteristics, the user can make a specific characteristic curve by choosing 16 points voluntarily according to field conditions and the user's need.

Tight Shut Open (TSHUT OP)

This allows the user to fully open valve at any value around the 20 mA current input signal.

Tight Shut Close (TSHUT CL)

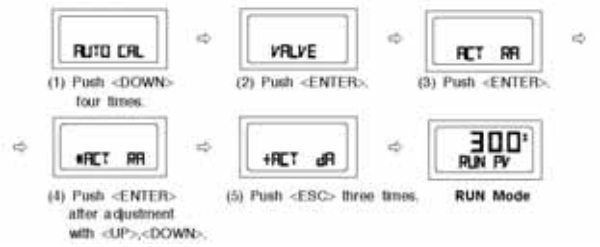
This allows the user to completely close valve at value around 4 mA input signal from outside.

Split Range Control (SPLIT)

This allows the user to control entire stroke with input signals of 4 to 20 mA, 4 to 12 mA or 12 to 20 mA.

Adjustment of Acting Type (ACT)

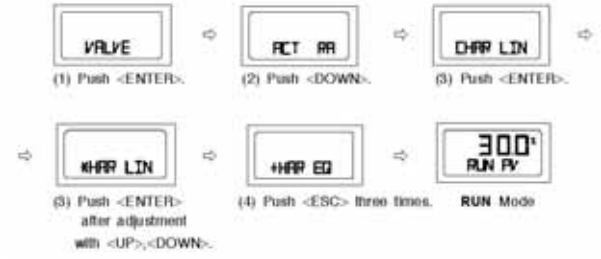
1. Push <ENTER> at RUN mode for six seconds and then AUTO CAL mode is displayed. Push <DOWN> four times to go into VALVE mode.
2. Push <ENTER> and ACT RA (in case of RA) is displayed.
3. Push <ENTER> again, then *ACT RA is displayed.
4. Adjust to *ACT DA by pushing <UP> or <DOWN> and save it with <ENTER>. +ACT DA message appears.



5. Push <ESC> three times to return to RUN mode.

Adjustment of Characteristics (CHAR)

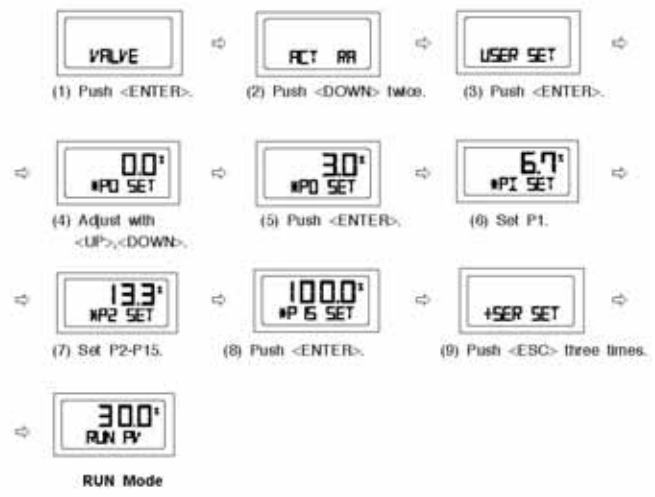
1. Push <ENTER> at VALVE mode and then push <DOWN>. CHAR LIN (in case of linear characteristics) mode is displayed.
2. Push <ENTER>. *HAR LIN mode is displayed and characteristics can be adjusted at this mode.
3. Adjust Characteristics (ex: EQ) by pushing <UP> or <DOWN> and save it with <ENTER>. +HAR EQ is displayed.



4. Push <ESC> three times to return to RUN mode.

Adjustment of User Characteristics (USER SET)

1. Push <ENTER> at VALVE mode and ACT RA or ACT DA is displayed.
2. Push <DOWN> twice, then USER SET mode is started.
3. Push <ENTER>. *P0 SET mode is displayed. In this mode, users can adjust the first point of characteristic in 16 points. The number on the LCD is the valve stroke percentage set to P0.
4. Adjust valve stroke percentage using <UP> or <DOWN>.
5. Save it with <ENTER>. While P0 value is being saved, *P1 SET mode is displayed.
6. *P1 SET mode is used to adjust the second point of characteristic in 16 points. Adjustment method is the same as *P0 SET mode.
7. Save the valve stroke percentage from P2 to P15 in the same way.
8. After adjustment of valve stroke percentage at *P15 SET mode, save it with <ENTER>.
9. +SER SET is displayed. Sixteen points of valve stroke percentage are



all set. Push <ESC> three times to return to RUN mode.

Adjustment of Tight Shut Open (TSHUT OP)

1. Push <ENTER> at VALVE mode and ACT RA or ACT DA is displayed. Push <DOWN> three times at this mode. TSHUT OP is displayed.
2. Push <ENTER>. *SHUT OP mode is displayed and in this mode users can set stroke at the time of Tight Open. Initial setting is done as 100%, which means cancellation of this function. Adjust the value (ex: 95.0%) by pushing <UP> or <DOWN> and save it with <ENTER>. +SHUT OP is displayed.

3. Push <ESC> three times to return to RUN mode.

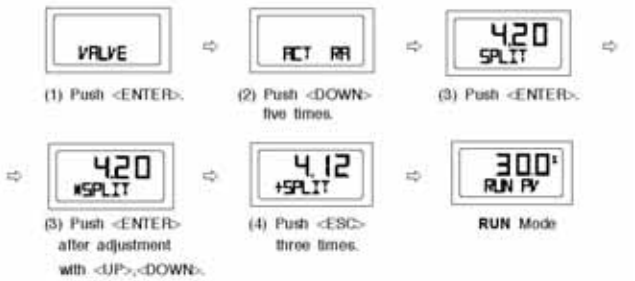
Adjustment of Tight Shut Close (TSHUT CL)

1. Push <ENTER> at VALVE mode and ACT RA or ACT DA is displayed. Push <DOWN> four times at this mode. TSHUT CL is displayed.
2. Push <ENTER>. *SHUT CL mode is displayed and in this mode users can set stroke at the time of Tight Close. Initial setting is done as 0.3%. 0% means cancellation of this function. Adjust the value (ex: 0.5%) by pushing <UP> or <DOWN> and save it by pushing <ENTER>. +SHUT CL is displayed.

3. Push <ESC> three times to return to RUN mode.

Adjustment of Split Range (SPLIT)

1. Push <ENTER> at VALVE mode and ACT RA or ACT DA is displayed.
2. Push <DOWN> five times and SPLIT mode is displayed. The numbers on the LCD are the range of current signal input to the positioner. 4 to 20 mA current signal is set as the standard.
3. Push <ENTER>. *SPLIT mode is displayed and input signal range can be adjusted. Adjust input signal range with <UP> or <DOWN> and save it with <ENTER>.
4. +SPLIT mode is displayed while saving adjusted range. Push <ESC>

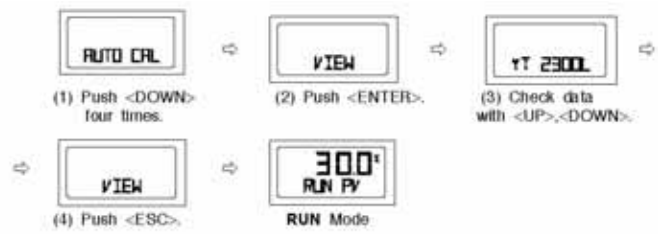


three times to return to RUN mode.

VIEW Mode

This mode provides users with various information about the Series 175 and 275 positioners. In this mode, users can change the valve stroke types displayed on LCD to % or numbers. Refer to the next table for information and description displayed on VIEW mode.

1. Push <DOWN> at AUTO CAL mode and VIEW mode is displayed.
2. Push <ENTER> at VIEW mode, then information mode is started.
3. Check information by using <UP> or <DOWN> and push <ESC>.



4. Push <ESC> again to return to RUN mode.

Options	Description
VERSION	Main software version
HART V	HART® protocol version
POL AddR	Channel address used in HART® protocol
bIAS VI	BIAS value necessary to motor control (This variable is used only by manufacturer)
OY Od	Total using time But if the product is used less than one minute from power-on to power-off, it is not added to total time
FULL OP	Full Open Time (sec) of valve
FULL CL	Full Close Time (sec) of valve
VM NOR	Display type of valve stroke on LCD Either % or number is available
Erro	Error or warning code currently occurred. Refer to the Code table.
VALUE 1	Currently controlled I value (This variable is used only by manufacturer)

Information checked on VIEW mode

Error and Warning Code
If there are any problems during Series 175 and 275 positioner operation, you can check the error and warning code at VIEW mode as follows:

Error Code
This code is displayed when the Series 175 and 275 positioner control becomes impossible. Code C, D applies.

Warning Code
This code is displayed when the positioner control is available but there is a possibility of malfunction or low accuracy. Code B, F, G, H applies.

Code	Description and Cause	Measures
A	None	None
B	The range of Pv Span – Pv Zero is less than 500. Operating angle of feedback is too small.	-Increase operating angle of feedback lever and execute AUTO1 calibration.
C	More than 10% error is continued over more than one minute. -There's no valve movement. -Valve friction is getting too big. -Setting pressure of regulator is changed.	-Check the pressure setting of air filter regulator. Adjust it to recommended pressure Execute BIAS calibration
D	I value is at I max or min limit. -Valve friction has changed. -Setting pressure of regulator has changed.	-Check the pressure setting of air filter regulator. Adjust it to recommended pressure Execute BIAS calibration
E	None	None
F	Full Open, Close time is less than one second. -Actuator size is too small.	-Use variable orifice. -Replace actuator to bigger one.
G	Pv is set lower than 100. -Operating angle of feedback lever is set too big.	-Adjust operating angle of feedback lever to be smaller and execute AUTO1 calibration.
H	Pv is greater than 4000. -Operating angle of feedback lever is set too big.	-Adjust operating angle of feedback lever to be smaller and execute AUTO1 calibration.

Error/Warning code

MAINTENANCE
The Series 175 & 275 PRECISOR® III Positioners are not field serviceable and should be returned if repair is needed (field repair should not be attempted and may void warranty). Be sure to include a brief description of the problem plus any relevant application notes. Contact customer service to receive a return goods authorization number before shipping.

Printed in U.S.A. 11/08 FR# R2-443558-00

W.E. ANDERSON DIV., DWYER INSTRUMENTS, INC.
P.O. BOX 358 • MICHIGAN CITY, INDIANA 46361 U.S.A.
Phone: 219/879-8000
Fax: 219/872-9057
www.dwyer-inst.com
e-mail: info@dwyer-inst.com